

"Rotten logs and sowbugs: the role of dead wood"

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(Source: <http://www.massforesters.org/coarse.htm>)

My appreciation of dead wood has something to do with sowbugs. As a child, turning over a rotten log in the forest around my New Hampshire home produced a satisfying scattering of creepy crawlers, often including centipedes and sowbugs. Discovering this world fueled my early suspicion that there was a lot more going on in the forest than you find if you don't poke around, or stay up late, or hang around to watch. That suspicion still lingers as I plan the management of large blocks of public watershed forest, with the mandate to discover and promote the range of life that dwells there, while bringing drinking water to the masses.

It has taken me awhile to learn that the sowbug, a 14-legged terrestrial crustacean that scavenges dead plant and animal material, is an important recycler of forest nutrients. Dead wood, the habitat of these critters, is a hot topic in scientific circles today, where it goes by the name of "coarse woody debris" (CWD). CWD is defined as "sound and rotting logs and stumps, and coarse roots in all stages of decay, generally greater than 3 inches in diameter, that provide habitat for plants, animals, and insects and a source of nutrients and structures for soil development" (Stevens, 1997). CWD also provides erosion control and links between habitats.

Among the increasingly complex questions landowners and foresters face is trying to determine how much "coarse woody debris" is required to sustain forest processes. Recent research in old growth forests has found that these very old forests generally have more and/or larger CWD than younger counterparts. Should we be concerned, as forest stewards, about the dynamics of CWD in our managed forests? I think we should.

To begin with, CWD is critically important as habitat for wildlife, both furry and creepy. Animals using CWD include squirrels, woodpeckers, grouse, bears, foxes, mice, and shrews as well as worms, salamanders, beetles, insect larvae, and of course centipedes and sowbugs. The list goes on to include as many as a thousand animal associations! Some creatures depend on CWD directly; others use it opportunistically. There are twice as many species of beetles that live on dead and dying wood as there are species of mammals, birds, reptiles, and amphibians in the entire world! Some flightless arthropods can survive major forest disturbances (clearcutting, blowdowns, fires) only within or beneath decaying logs. Whether as shelter, a source of foraging, or energy for reproduction, the structure, nutrients, and moisture of rotting wood supports a teeming mass of animal life.

CWD also provides critical support for plants. There is strong correlation between the range of woody decay stages and the diversity of nonvascular plants (e.g. mosses) and fungi in a forest, because many of these plants and fungi survive on a specific organic base. When CWD is sporadic rather than continuous, the likelihood of colonization and dispersal of fungi is greatly reduced. While there is some debate about its importance to regeneration in Eastern forests, seedlings (usually conifers) often gain advantage from the steady moisture supplied by rotting logs. Finally, beyond their role in nutrient cycling, mosses and lichens weave a velvety death shroud that moves debris from "wasted wood" to an aesthetically pleasing component of the forest floor.

Coarse woody debris is dynamic, both as individual pieces and from a stand or landscape perspective. Forest stands are initiated by disturbance, either intentional or natural. Immediately following disturbances, CWD is frequently very high (for harvesting disturbances, CWD volumes depend on utilization standards). Then, as the next forest begins to grow, persistent dead wood declines while the stand is dominated by young, vigorous growth. This downturn levels off as the overstory begins to mature and competition among larger trees grows. With size and age comes an increased susceptibility to insects, diseases, and weather disturbances, so that older stands may accumulate large woody debris in volumes that can approach those associated with major disturbances.

There are differences in the quality of coarse woody debris at various stages of forest maturation. CWD may function as a temporary accumulator of nutrients, and eventually as a slow-release fertilizer. This occurs in part because rotting wood supports populations of saprophytic organisms that gather and hold nutrients as their populations grow, but eventually run out of resources and return these nutrients to the soil. CWD also provides conditions that support nitrogen-fixing bacteria and provide a moist refuge for tree-supporting mycorrhizal fungi. While all CWD eventually functions like any organic addition to the soil, large pieces may provide significant additional nutrient storage above and beyond that of the organic layers of the soil, and softwoods generally decay more gradually than deciduous CWD.

In the managed forest, there will always be a tension between the desire to utilize (in part to make the job look neater) and the perceived values of large woody debris. We don't know for sure how much CWD the forest needs. Yet given the volumes that are known to accumulate in very old forests, our managed stands could probably benefit from leaving more behind (see Table 1). In a market that makes it difficult to profitably remove low-grade products from the woods, we have an enhanced opportunity to argue for the greater value of leaving that wood "just to rot". What coarse woody debris may lack in our "aesthetic eye", it may gain as our "ecological eye" sees its real worth.

Table 1. How much CWD is enough?

One of the "conditions" attached to the Green Certification of the Quabbin Forest requires MDC to determine a minimum volume of coarse woody debris to be left behind following every harvesting operation, especially those that involve whole tree chipping. To arrive at this figure, MDC studies a wide range of sites in Massachusetts, including recently harvested areas, managed areas that had not been treated for a decade or more, and old growth areas. Some typical measurements and stand types are listed below. From the entire data set, MDC determined that the average volume of CWD was about three cords. Since this figure was pulled upward by the very large volumes of CWD in recently harvested softwood stands, MDC and the Green Certification audit team agreed to a minimum volume of approximately two cords of CWD larger than 3" in diameter, per acre. This standard is now a component of every timber harvest on MDC land.

Some examples from the MDC study

Forest Type	Harvesting	CWD/Acre
Old growth hemlock/hardwood	None	5.7 cords
Old growth hemlock/hardwood	None	5.0 cords
White pine	None in at least 30 yrs.	2.1 cords
Northern hardwoods	None in at least 30 yrs.	1.4 cords
Hemlock/hardwood	None in at least 30 yrs.	3.9 cords
Red pine clearcut, whole tree chipping	Recent	0.3 cords
Red pine plantation, 58 years old	Uncut	2.9 cords
Red pine, following blowdown	Recent, poor utilization	11.0 cords

Coarse Woody Debris Management Guidelines

1. Larger pieces of CWD are more valuable than smaller pieces.
2. CWD scattered across a site is more valuable than if it is concentrated (although it is good to have some piles).
3. It is important to maintain a full range of CWD decay classes (from hard to crumbling).
4. Coniferous CWD is generally more long-lasting than deciduous wood.
5. A long-term approach to CWD management needs to consider the distribution and quantity of future sources.

Internet sites with more information on Coarse Woody Debris:

<http://www.for.gov.bc.ca/hfd/pubs/docs/Wp/Wp30.pdf>